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## ORIGINAL ARTICLES

### TREATMENT OF THE LACERATED AND INFECTED CERVIX UTERI.*

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Interest in the results following the various methods of treating infected and lacerated cervices has been stimulated largely by the work of Leonard in 1914, in his comparison of the end results in amputation and trachelorrhaphy; and further by the article of Sturmdorff in 1916, on "Tracheloplastic Methods and Results."

This report is undertaken with the idea of estimating the relative value in the treatment of infections and lacerations of the cervix in three types of operations, namely:

Actual cauterization.
Trachelorrhaphy.
Amputation.

The investigation has covered 373 cases operated upon at the Women's Clinic of the Stanford University Medical School during the past eight years. Special attention has been paid to the relief of leucorrhoea, pelvic pain, objective cure of cervical pathology and the relationship to future pregnancies.

Infection of the lower genital tract in women is limited almost entirely to the glandular structures; vulvo-vaginal, urethral and cervical. These structures when intact are immune to practically all organisms except that of gonorrhoea. Infections of the undamaged cervix is practically always gonorrhoeal at its inception. The gonococci are replaced after variable lengths of time by other organisms, the gonococci seeming to serve largely to prepare the field for other types of infection. Curtis, in 1914, showed that these secondarily infecting organisms were various strains of bacilli, diplococci and streptococci, mostly anaerobic. In the damaged cervix the soil is prepared for infection by the opening up and traumatizing of the tissues. The importance of laceration of the cervix in the incidence of its infection is indicated by the fact that in 111 cases of laceration in this series, in which a microscopical section of the cervix was examined, 66 cases or 59½ per cent, were infected.

Infection of the cervix uteri concerns the racemose glands lining the cervical canal from the external to the internal os. Microscopical examination of sections through an infected cervix shows hyperplasia in the interstitial tissue about the glands, round cell infiltration, with occasional collections resembling actual abscess formation. If the cervicitis is at all chronic there are many cysts of the glands filled with mucoid material caused by the occlusion of the gland ducts. The so-called erosions are often present, in which the columnar epithelium of the canal has replaced varying amounts of the stratified squamous epithelium of the vaginal portion of the cervix. Infection of the cervical tissues diminishes in intensity as the internal os is approached and only rarely passes this barrier, to invade the endometrium. The immunity of the endometrium is well shown in 86 cases in this series which showed microscopical evidence of cervicitis, and in which specimens of endometrium were obtained at the time of operation. Of these cases, only 12, that is 14 per cent, shows any infection of the endometrium. It is also interesting to note that of these 86 cases, 37 per cent had palpable evidence of marked pelvic inflammatory disease, showing that the usual route of infection of the internal pelvic organs is not the uterine cavity.

Lymphatic drainage from the entire mucous surface of the cervix and uterus is upward and outward throughout the musculature of the entire organ towards the serous coat. Vessels leave the uterus by way of the sacrouterine, cardinal and broad ligaments. Many fine lymph vessels traverse these structures to empty into the sacral, hypogastric and lumbar nodes. By this path, infection of the glandular elements of the cervix spreads upward and thus may involve any or all of the internal pelvic organs. This is the usual route of infection in the production of the so-called pelvic inflammatory disease.

Symptoms of laceration and infection of the cervix as generally given are numerous and varied, but aside from the objective signs of discharge and the local irritation therefrom, practically all the complaints are due to the involvement of the pelvic organs by the upward extension of infection.

There is no treatment indicated for any healed laceration of the cervix in the absence of infection. However, from the known high incidence of infection of lacerations (59½ per cent), considerable can be done in the way of prophylaxis, that is, repair of the laceration at or near the time of its inception, before infection has taken place. There has been considerable discussion as to the correct time in which to repair lacerations of

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the cervix; whether it should be done immediately following delivery or at some time during the first six weeks post-partum. Certainly the longer the interval between occurrence and repair of the laceration, the greater the possibility of infection. It has been urged that the benefits of immediate trachelorrhaphy are outweighed by the following disadvantages:

1. Added danger of the puerperal sepsis.
2. Odema of the tissues preventing proper coaptation of parts.
3. Free drainage of lochia prevented.
4. That the technique is difficult.

In our experience we have found none of these objections valid. In the routine exposure of the cervix after expression of the placenta in 700 consecutive cases in the Maternity Ward of the Stanford University Medical School it was found necessary to suture the cervix in 73 cases, roughly 10 per cent.

The maternal morbidity has not increased as a result of this procedure. Odema of the tissues of the cervix certainly obscures the anatomy somewhat, but the difficulty of getting proper coaptation of the lacerated edges is by no means insurmountable. After proper approximation of lacerated edges there should be no more obstruction to the drainage of lochia than in the unlacerated cases.

The technique is quite simple: Immediately after the expression of the placenta, the patient is put in lithotomy position. The cervix is exposed by making pressure over the fundus, and an assistant retracts the vulvar orifice, the edges of the cervix are grasped with ring forceps and the edge followed around, using three pairs of forceps. The lacerated edges are brought into vivid relief by the use of ether sponges. Lacerated edges are approximated with interrupted or continuous mattress chromic sutures. With obstetrical operations considered as major surgery, as they should be, the cervical manipulation in an immediate repair should not increase the liability to puerperal sepsis in any greater degree than the application of blades in a low forceps maneuver or the introduction of a vaginal pack.

Our results have borne out this statement, and it is seen that the 7 per cent morbidity is easily within the usual fever limits. The healing was more satisfactory in primipara than in multipara. Scar tissue from the secondary healing of old lacerations and the consequent higher percentage of cervical infection in multipara is the apparent explanation. The number of days required in the hospital was not increased, as it is our custom to keep patients in the hospital from 11 to 14 days post-partum. The factors in the production of lacerations will not be discussed, but it is important to note that lacerations occur in many spontaneous deliveries.

Immediate repair of laceration of the cervix following childbirth can only be done in a hospital and with an assistant, but the advantage to the patient's future welfare are easily worth the trouble when from 70 to 90 per cent of patients are saved the liability to infection of the cervix with its not infrequent sequelae.

### End Results in Cauterization, Trachelorrhaphy, Amputation.

In the comparison of the end results in these types of cervical operation for the cure of cervicitis, with or without laceration, the records are compiled from 300 post-operative histories. The patients were all operated upon in the Women's Clinic and Gynecological Division of the Stanford University Medical School during the past eight years. The three series of 100 each were taken consecutively. Data concerning relief of cervical discharge, pelvic pain and subsequent pregnancies was obtained from the post-operative histories. The reports on postoperative cervical discharge are based on actual observations taken in the Women's Clinic. The general scheme for the investigation is that used by Leonard in 1914.

In the 100 cases of cauterization, 86 were cauterized radially, with the Paquelin cautery, under general anaesthesia; at each stroke of the cautery the point being buried in the cervical glandular tissue. Fourteen cases were done with the electric cautery without anaesthesia and were consequently more superficial. It is our custom to have the patient take a hot douche every day for a period of about two weeks following cautery, less frequently after that until at the end of about six weeks the cervix should be healed and clean. In the 100 cases of cauterization reported, an abnormal cervical discharge was present in 100 per cent. Gonorrhoea was suggestive in 18 per cent and positive in 7 per cent of cases. Pelvic inflammatory disease of the adnexa was present in 37 per cent of cases.

In the 200 cases of trachelorrhaphy and amputation, 125 complained of leucorrhoea and there was microscopical evidence of cervical infection in 132 cases. Erosions were present in 120 and lacerations in 162 cases. In general, trachelorrhaphies were done on those with a relatively mild cervicitis, while those of more extensive infection of laceration were amputated. Two types of trachelorrhaphy were done, 87 Emmett type and 13 Sturmdorff. In the amputations, 51 were of the circular type and 49 the Shroder operation.

The effects of cauterization, trachelorrhapy and amputation were contrasted in the relief of leucorrhoea in 225 cases. The cure of the discharge by amputation in 82 per cent is in marked contrast to the 62 per cent cure in cauterization and the 40 per cent cure in trachelorrhapy. Cauterization shows a high percentage of cases merely improved; this is probably because of an insufficient cauterization. In the cured or improved totals, cauterization leads, with trachelorrhapy only 59 per cent.

A comparison of the two types of trachelorrhapy shows the Sturmdorff operation leading the Emmett operation in the cure or improvement of leucorrhoea, 87 per cent to 57 per cent. The inference is plain; cure of cervical discharge lies in the removal of the infected glandular tissue to the cervix. The results of the Sturmdorff

enucleation compare favorably with those of amputation.

The relationship of pelvic pain and dysmenorrhoea to cervical disease is not always clear, on account of the not infrequent association of inflammatory and postural pelvic pathology. Of 89 patients complaining of pelvic pain or dysmenorrhoea, 43 were cauterized, 28 had trachelorraphy and 18 had amputation performed.

The cases have been divided into two groups, those having only cervical and possibly perineal work, and those having a laparotomy in addition to the cervical operation. Although the number of cases is small, the percentage is still against trachelorraphy, with cauterization showing 86 per cent cured or improved, amputation 80 per cent and trachelorrhaphy 60 per cent. The explanation is not far to seek: trachelorrhaphy fails to remove the infected tissue and symptoms from cervical lesions lie mainly in the infection present.

A series containing 199 cases was compiled which represents those of the original 300 who were below the age of 40 at the time of their operation and who were not surgically sterilized at that time. The incidence of pregnancy following trachelorrhaphy and amputation is practically the same, 22 per cent and 21.5 per cent, respectively. This is rather interesting in the light of Leonard's conclusions, that pregnancies were about twice as frequent after trachelorrhaphy. It must be remembered that amputations are performed at various heights, and that the functions of the uterus as regards pregnancy is disturbed in proportion to the amount of muscular tissue removed. In this clinic we have always removed as little tissue at operation as was compatible with removal of the infection. The cauterizations show a remarkably low percentage post-operative pregnancies, 9 per cent. Part of the explanation probably concerns the fact that the incidence of pelvic inflammatory disease was about twice that of the other two series. There were no cases of post-operative stenosis as indicated by the development of dysmenorrhoea to explain the sterility. It is seen that the number of cases which showed merely a diminution in the amount of discharge was very high, 34 per cent. After cautery we know that the cervical canal is diminished in caliber so that if the cervical discharge is not cured, it may still be sufficient to plug the os. It is known that stenosis is not a frequent cause of sterility but that the presence of a mucous plug in the canal is an efficient barrier to the ingress of spermatozoa. From this consideration we can say that pregnancy following cauterization of the cervix is infrequent and that the incident following trachelorrhapy and amputation is about equal.

The course of the pregnancies are considered after cervical operations. The question of the spontaneous interruptions in pregnancies and the character of labor in those progressing to term is of considerable importance in determining the value of cervical operations for women in the childbearing period. The average age in these cases was 29½, the average age in the three types of cases are close enough to eliminate that as a factor in the comparison. In this chart the number and character of pregnancies before and after operation are contrasted. It is seen that after cauterization, the number of pregnancies going to term is larger than before operation, with a consequent decrease in the number of abortions. In the cases of trachelorrhaphy and amputation, there was a very slight increase in the tendency to abortion, the increase being about equal in the two types of operation. Labor following these operations shows no marked departure from the normal. After cautery all the cases that went to term had apparently normal, spontaneous labors. Of the twelve cases of trachelorrhaphy who went to term, nine had easy, spontaneous labors, one was delivered by abdominal section on account of a previous repair for complete perineal laceration and two had labor induced with Vorhees' bags, because of failure to go into labor due to rigidity of the cervix. In the cases of amputation, eight became pregnant, of which two aborted in the second month, one had premature rupture of the membranes with prolapse of the cord in the fourth month, this being a case in which a high amputation had been done. Of the five cases progressing to term, four had easy, spontaneous labors, while the fifth went into labor a month past term, had a moderately long labor and received a laceration of the cervix.

In every case of Emmett trachelorrhaphy the cervix was re-lacerated at delivery.

In a consideration of the results following operations on the cervix it becomes evident that the pathology and symptomatology depend upon the infection in the cervical glands. The relief of symptoms is most marked in those procedures which destroy or remove the infected tissue. Excision of the infected area, as in amputation, has given the best result in the cure of symptoms and has had practically no more deleterous effect upon pregnancy than other operations. Cauterization has given a high percentage in the cure of symptoms, but the incidence of pregnancy after it is very low.

The operation which combines the virtues of amputation with the least apparent disturbance of the function of pregnancy is that described by Sturmdorff. We perform the operation essentially as described by him, with the exception of a few minor details, such as the use of chromic catgut suture material in place of the silkworm gut advocated by Sturmdorff, and the use of a buried suture on either side of the amputated cervix to control hemorrhage. The operation as performed in this clinic is as follows:

Slight preliminary dilatation of the cervix with bougie dilators. This need cause no damage if done carefully and facilitates exact dissection of the glandular tissue to the internal os and permits good approximation of the inverted vaginal flap to the endometrial margin. With the anterior and posterior cervical lips in the grasp of tenacula, a circular incision is made around the cervix at

the juncture of the infected cervical and healthy vaginal mucosa. The vaginal cuff is then well loosened with dissecting scissors all the way around the cervix in order to give good mucosal flaps for inverting. If there is marked cystocele, care must be taken to separate and push up the lower bladder margin. With tension on the cervical lips, the gland-bearing area is dissected out with a sharp knife, to the level of the internal os. When about half this cone is enucleated, retraction is made laterally on the vaginal flaps and a buried suture is laid on each side in the muscular tissue of the cervix at right angles to the long axis of the organ. The operation is practically bloodless from this time on and we believe the tendency to post-operative hemorrhage is diminished. After the cone of glandular tissue has been amputatd at the height of the internal os, the anterior and posterior vaginal flaps are inverted into the hollowed out cervix by the double inverting stitch of Sturmdorff. Thus, healthy vaginal mucosa is substituted for infected cervical mucosa and the musculature and the nerve supply of the uterus are undamaged by the operation. If necessary, a figure-of-eight approximating suture may be used in the mucosa on either side of the new external os. Thus six sutures are used in all. The technique is simple, and the operation can be performed in the majority of cases in 10 to 15 minutes, with no special instruments.

CONCLUSIONS.

In hospital obstetrical practice, in trained hands, the best prophylactic procedure against the development of infection of the cervix is the routine exposure of the cervix in primipara, after delivery, and suture of the lacerations.

For the cure of infection and laceration of the cervix, with the accompanying symptoms, certain types of amputation are the operations of choice.

Trachelorrhaphy is preferable to cauterization if future pregnancy is a consideration.

Cauterization, for the treatment of infection of the cervix, should only be undertaken if future pregnancy is no longer a consideration.

The Sturmdorff conical enucleation of the glandular elements of the cervix possesses the virtue of high amputation, and should give the least possible interference with future pregnancies.

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## NEW YORK WELFARE AGENCIES UNITE

A news item states that efforts are under way to group, for purposes of co-operation, more than two thousand charitable and welfare organizations of New York. It is reported that "charitable societies, with their increasing specialization and their undeniable duplication of effort, have been subject of late to a considerable amount of criticism from persons who fail to see a reason for their multiplicity."

What a commentary! The reasons ought to be perfectly obvious, but they are not reasons that mean efficient medical and social service for the public.

## PRELIMINARY REPORT ON AN INVESTIGATION OF THE "PROVOCATIVE WASSERMANN" CONTROLLED BY THE ICE-BOX METHOD

By RUTH THYGESON SHEPARDSON, A. B., Special Worker, Skin Clinic, Stanford University Medical School

In view of the uncertainty regarding the status of the "provocative Wassermann" test, it was decided to try out the method with the aid of funds from the United States Interdepartmental Social Hygiene Board. This work is being carried on in the service of Professor H. E. Alderson (Skin and Syphilis Clinic) of the Stanford University Medical School. Owing to unforeseen interruptions, the preliminary report has been much delayed. Although recent publications have described and discussed the ice-box method, much of our work antedates the same, having been conducted in 1919-1920.

The "provocative Wassermann" appears still to be in the indefinite stage of experimentation where the opinions as to its value in the diagnosis of syphilis vary anywhere from enthusiastic advocacy to unqualified disapproval.

It was Gennerich in 1910, who first called attention to the phenomenon of a reversal from negative to positive in a Wassermann reaction soon after an injection of salvarsan. He reported twelve cases, each exhibiting one negative before the injection, and becoming positive from twenty-four hours to fifteen days (the major portion within the first three days) after the injection. This observation of Gennerich was soon confirmed by Milian.

In 1914 we read of some experimentation on the subject by Pease. He believed the "provocative" analogous to the Herxheimer reaction, namely the accentuation of the clinical symptoms of syphilis immediately following treatment with salvarsan, and thought that the most reasonable explanation of the "provocative" effect was that more spirochetes were killed just after the injection and, therefore, more bodies thrown into the blood. In his tests he used 0.4-0.6 gms. of neosalvarsan, took the patient's blood immediately before and on several days following the injection, and observed that the reaction was most apt to become positive on the two days following the injection. His conclusions were that the "provocative Wassermann" was valuable in all stages of syphilis, but chiefly in the tertiary stage, and that it was "fully as reliable as the Luetin test" and offered "the best evidence at present of actual cure of lues."

In direct opposition to these favorable observations of Pease, is King's report in 1916. He gets the impression from the literature that the test is by no means on an established basis, and calls attention to the work of Boas and Haller on the factors of technical error and variation in the reagents used in performing any Wassermann test. Boas showed different results with the same serum, same technic, and same reagents at different times. Haller, however, did not discover any appreciable variation in the serum itself, con-